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Road Potholes Detection using Deep Learning

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Abstract: *Potholes are a danger on the road, endangering both automobiles and pedestrians. It is one of the leading causes of road accidents and the loss of human life and property in most developing countries. As a result, data on current road conditions must be collected and updated on a regular basis so that drivers can be notified of alternate routes and the concerned government department can take quick action to remove potholes for the benefit of commuters. Based on the following parameters, calculate the road damage percentage: The pothole's depth. The quantity of potholes on the route. Assign road priority based on which road should be fixed first, and terrify the government with a proper report. The user initially logs in to our portal, where he or she can upload a photograph of a road and its location. As soon as we have the data, we generate a database table with each named road and any photographs that users provide. After that, the ML model predicts the damage %. We'll take the average of the damage percentages of all connected photographs to compute the damage percentage of each identified road. The average percentage of damage for that road will be the result. Using object detection algorithms on photos captured from a smartphone camera is a simple and efficient technique to locate potholes on roads.*

Keywords: Feature Extraction, Segmentation, CNN, Deep Learning

I. INTRODUCTION

We have become accustomed to outstanding levels of mobility in recent years; the roads and highways utilised for travel spring to mind. They are undoubtedly the most widely utilised mode of safe transportation, serving to connect cities, communities, and even countries. Because of all of this use and other natural reasons, these road networks need to be checked and maintained frequently in order to run smoothly and safely. After all, the roads and highways we utilise on a daily basis are man-made and hence imperfect. If left ignored, these roadways can become dangerous, causing inconvenience and possibly endangering people's safety. Determine the percentage of road damage using the following parameters:

- Depth of the pothole.
- Number of potholes on the road.
- Assign road priority based on which road should be fixed first, and notify the government with a proper report.

1.1 Objective

- The project's major goal is to detect potholes on the road, their depths, and the quantity of potholes on the road, then give priority to the roads based on which ones should be repaired first, and terrify the government with proper reports.
- To ensure the commuters' safety.
- When users notice the presence of a pothole, they send a message to the Corporator, identifying the position of the pothole.
- If the pothole is fixed, the data from the transaction database can be recovered and updated.

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II. LITERATURE SURVEY

Sr. No	Paper name	Author name	Abstract	Limitation	Year
1	A Comparative Evaluation of the Deep Learning Algorithms for Pothole Detection	Roopak Rastogi, Uttam Kumar	Potholes are a danger on the road, endangering both automobiles and pedestrians . It is one of the leading causes of road accidents and loss of human life and property in most developing countries. As a result, data on current road conditions must be collected and updated on a regular basis so that drivers can be notified of alternate routes and the concerned government department can take quick action to remove potholes for the benefit of commuters.	It is a real-time pothole detection device that may be put on the dashboard of manual and motor vehicles. The limitation of this paradigm is that it proves to be rather costly to set up.	2020
2	Road Deformation Detection	Kundana Angelina Govada	This device is being developed to identify potholes and humps so that accidents can be avoided. The sensing, controlling, and output functions are the three main functions of this system. The ultrasonic sensors are used to locate potholes and humps, as well as to measure their depth and height between the car and the road. The ultrasonic sensors in the front of the car are used to identify the front vehicles within its range. The rear-facing sensor detects vehicles approaching from behind and sends out alert signals.	Most of the Sensor gives false alarms. This includes misalignment.	2020
3	Potholes Detection Based on SVM in the Pavement Distress Image	Jin Lin	This work proposes a method based on pavement defect picture segmentation to identify a connected region and determine whether it is a pothole or not.	If the photos are not correctly illuminated, the training model fails to recognize pavement flaws.	2018

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III. System Architecture

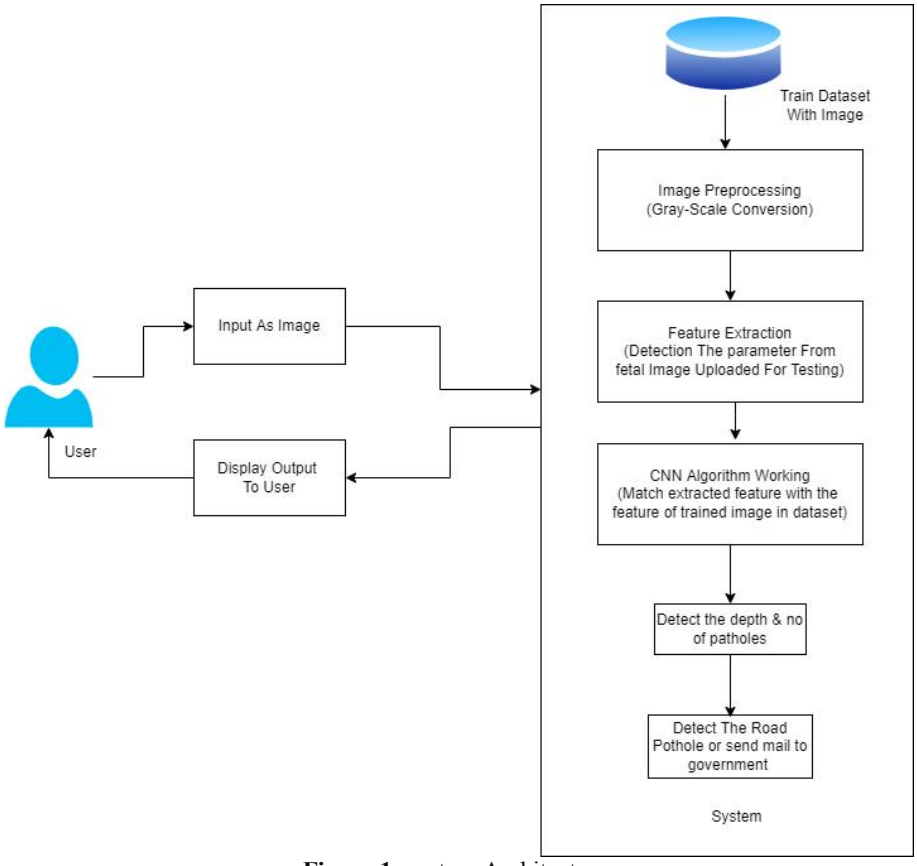

Figure 1: system Architecture

Image preprocessing is the process of preparing images for use in model training and inference. This covers resizing, orienting, and colour corrections, among other things.

The steps to be taken are:

- Read image.
- Resize the image
- Remove noise(Denoise)
- Segmentation.
- Morphology(smoothing edges)

When an algorithm's input data is too vast to analyze and is suspected of being redundant, such as the same measurement in feet and meter, or the repetitiveness of images displayed as pixels, it can be reduced to a smaller collection of features. Image classification is the process of categorizing and labelling groups of pixels or vectors in an image according to a set of rules. One or more spectral or textural properties can be used to create the classification law.

IV. Proposed Algorithm

4.1 CNN

1. Create a small convolutional neural network according to the architecture below.
2. Select photos for convolutional neural network training.
3. Feature filters/feature maps extraction
4. On the convolutional layer, use the ReLu Activation function to convert all negative values to zero.
5. Then, on convolutional layers, use max pooling.
6. This layer is used to convert a 2D matrix into a 1D array.

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7. Create fully connected layer
8. Then, input an image into CNN to identify the content of an image.
9. Error rate calculation via back propagation
10. Then generate a CNN model.

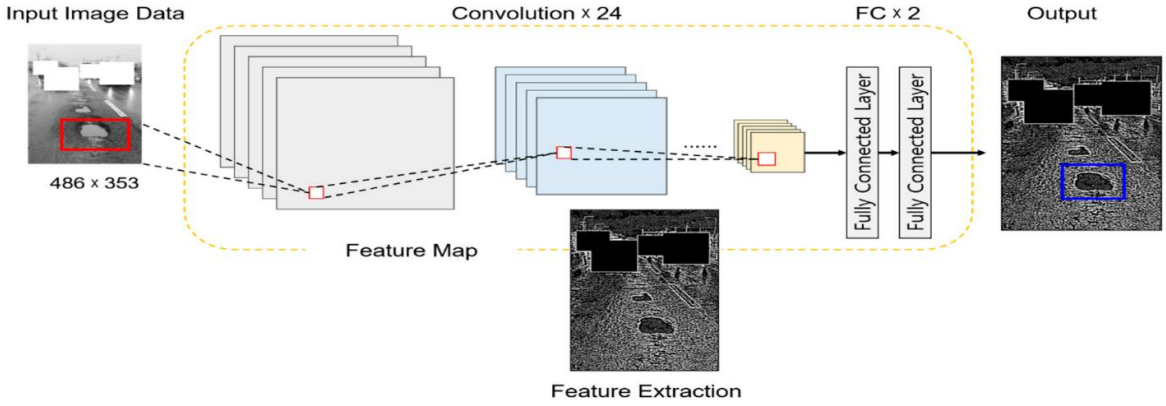

Figure 2: CNN Flow

4.2 YOLO

YOLO is a real-time object identification technique that use neural networks. Because of its speed and precision, this algorithm is very popular. It has been used to identify traffic signals, pedestrians, parking metres, and animals in a variety of applications. This phenomena is attempting to answer two fundamental questions:

What exactly is the goal? This inquiry aims to pinpoint the object in a certain situation image.

What happened to it? This inquiry aims to pinpoint the exact location of the object within the image's object

You Only Look Once is abbreviated as YOLO.

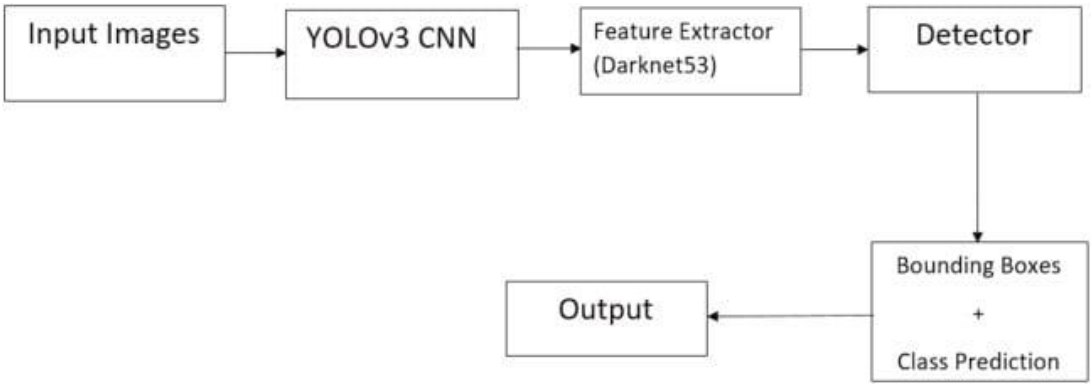

Figure 3: Block Diagram of YOLO

The YOLO algorithm detects objects using convolutional neural networks (CNN) in real-time objects.

V. Result and Discussion

The results of the YOLOv4 and Faster R-CNN models in different daylight conditions and with varied numbers of potholes are compared in sample photos. We can observe that the model is capable of appropriately detecting potholes. Potholes may be detected with high precision and recall using the proposed method. One of our experiments' driving paths, as well as the locations of potholes that were automatically recognised using the proposed method. The results show that feature extraction from the time and frequency domains is the most effective, while extracting features only from the time or frequency domain is appropriate in circumstances where computation is limited. Experiments with various datasets demonstrated that while the proposed strategy is universal, it is not sufficiently robust for various types of roads. For real-world applications, a model that broadly categorises roads according to quality and training is necessary. Other elements,

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such as smartphone and vehicle kinds, are also deserving of additional investigation in this study.

VI. Conclusion

The pothole detection problem present more challenges with varying pothole size, diverse road construction materials used, different traffic conditions, and changing weather scenarios. This project successfully assists any user in submitting photographs of damaged roads to the authorities. The suggested architecture can be connected with a smartphone camera using a Raspberry Pi and installed on the dashboard of manual and autonomous automobiles for real-time pothole identification due to its high accuracy. This will provide drivers and commuters with safe driving advice.

References

[1]. https://www.ibef.org/industry/roads-india.aspx [Last accessed: 15 August, 2020. 09:00 am.]
[2]. K. Taehyeong, and S. Ryu, "Review and analysis of Pothole detection methods," J. of Emerg. Trends in Computing and Info. Sci., vol. 5(8), pp. 603-608, 2014.
[3]. K. Christian, and I. Brilakis, "Pothole detection in asphalt pavement images," Adv. Engg. Info., vol. 25(3), pp. 507-515, 2011.
[4]. H. Lokeshwor, L.K. Das, and S.K. Sud, "Method for automated assessment of Potholes, Cracks and Patches from road surface video clips," Procedia-Social and Behavioral Sci., vol. 104(2013), pp. 312-321, 2013.
[5]. R. Karthika, and L. Parameswaran, "An automated vision-based algorithm for out of context detection in images," Int. J. Signal and Imaging Sys. Engg., vol. 11(1), pp. 1-8, 2018.